

**Before The
Federal Communications Commission
Washington, D.C. 20554**

In The Matter Of)	
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Modernizing the E-rate Program)	WC Docket No. 13-184
For Schools and Libraries)	
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**COMMENTS OF THE
BENTON FOUNDATION**

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The Benton Foundation¹ (“Benton”) respectfully submits these comments in response to the Federal Communications Commission’s (“Commission”) recent Notice of Proposed Rulemaking regarding the E-rate program.² Benton works to ensure that media and telecommunications serve the public interest and enhance our democracy. Benton pursues this mission by seeking policy solutions that support the values of access, diversity and equity, and by demonstrating the value of media and telecommunications for improving the quality of life for all.

Introduction

In the mid-1990s, Benton worked alongside policymakers to support the creation of the E-rate program. During this early E-rate debate, Benton worked to aggregate key data and case studies to better inform decision-makers on the potential of the Internet and its use in education. Following the creation of the E-rate program, Benton funded and published original research examining the role of technology to enhance education. Benton has remained a strong supporter of technology in education and is an active member of the Schools Health and Libraries Broadband Coalition (SHLB). Benton has worked with SHLB to file separate comments within this docket focused on specific proposals that would ensure the E-rate program will meet the infrastructure needs of schools and libraries. In December 2008, Benton published *An Action Plan for America*³, offering policymakers and advocates a comprehensive set of goals to meet

1 The Benton Foundation is a nonprofit organization dedicated to promoting communication in the public interest. These comments reflect the institutional view of the Foundation and, unless obvious from the text, are not intended to reflect the views of individual Foundation officers, directors, or advisors."

2 See, Modernizing the E-Rate Program for Schools and Libraries, Notice of Proposed Rulemaking, WC Docket No. 13-184 (rel. July, 2013) (“Notice”).

3 http://benton.org/initiatives/broadband_benefits/action_plan

our nation's broadband needs. The plan laid out by Benton emphasized the importance of technology as a critical tool that connects and lifts communities by strengthening access to and information about jobs and the economy, education, healthcare, energy and the environment, public safety and security, and reinvigorating our democracy. Two years later, the Commission released the National Broadband Plan (NBP). Since its publication, Benton has tracked its over 200 recommendations through our service, the National Broadband Plan Implementation Tracker.⁴ Since the release of the NBP, Benton has focused our advocacy efforts on the reform of the Universal Service Fund (USF) Programs, participating in proceedings regarding the reform of the Connect America Fund (CAF), Mobility Fund, Lifeline and Link-Up programs, and the E-rate program. Benton has also served on the FCC's Consumer Advisory Committee's (CAC) leading subcommittee on USF reform issues. Throughout our USF advocacy, Benton has proposed or supported reforms that would ensure relevant, robust broadband access for our country's most vulnerable populations.

With President Barack Obama's announcement of the ConnectED initiative,⁵ Benton has been working with E-rate advocates, the educational technology industry, schools, and libraries to identify data and cases studies that would better inform the E-rate reform process. Benton is tracking developments in the debate over the E-rate program at <http://benton.org/initiatives/e-rate>⁶. In order to capture the importance of the E-rate program, Benton is aggregating and highlighting new research, analysis, speeches, filings, and press accounts about modernizing telecommunications infrastructure for schools and libraries. Benton is also linking to workshops, hearings and other public forums where the future of the E-rate is being discussed.

Summary

Benton strongly supports the ConnectED initiative and is pleased that the Administration is taking a careful, holistic approach to developing a robust technology program to meet basic education needs. Benton encourages the Commission to adopt new goals and policies for the E-rate program to ensure that 99% of America's students and teachers are connected to high-speed broadband (defined as speed no less than 100 Mbps and meets the target of 1Gbps) within the next 5 years. Benton encourages the Commission to focus its review of the E-rate program by first analyzing currently unmet needs and preparing for the future needs of schools and libraries.

4 See http://benton.org/initiatives/national_broadband_plan

5 President Obama Unveils ConnectED Initiative to Bring America's Students into Digital Age (June 6, 2013) <http://www.whitehouse.gov/the-press-office/2013/06/06/president-obama-unveils-connected-initiative-bring-america-s-students-di>

6 Like our NBP Implementation Tracker, Benton's E-rate page is powered by our free Headlines service which provides daily updates on developments in telecommunications policymaking. Since 1996, Benton's Headlines has kept readers informed about how the decisions of policymakers impact how communications tools are used to improve lives.

In these comments, and on the Benton E-rate webpage, we focus on identifying populations and goals that would benefit most from enhancements to the E-rate program. To meet the needs of these populations and goals we support policies that would expand the E-rate funding cap, allow for funding that supports flexible infrastructure investment, create a transparent and open telecommunications database on prices and speeds⁷, and endorse proposals which encourage schools and libraries to serve the communication needs of vulnerable populations in their communities, for example, through after-hours community Wi-Fi use.

I. Understanding the Benefits of a Robust E-rate Program

The E-rate program has successfully connected our nation's schools and libraries to the Internet. However to take full advantage of today's best educational information and services, our community institutions (schools and libraries) will need more than basic connectivity; they need support for high-capacity broadband.

The benefits of ConnectED and faster Internet in schools and libraries are enormous for:

- Bridging the digital divide and ensuring that every child has the same chance to succeed;
- Our competitiveness. With other countries, trying to get ahead, giving our kids a chance to compete and win in the global economy, and boosting the number of STEM grads;
- Businesses. We can't *out compete* the world unless we *out educate* first. Businesses can't find the qualified graduates they need to fill the high paying jobs open today;
- Rural America. Enabling children in rural America access to the same universe of knowledge available to students in major cities;
- Children. Transforming the way students learn;
- Educators. Transforming the way teachers teach and administrators manage schools;
- Our libraries as the essential public and community gateways for information.
- Enabling tomorrow's learning technologies today, such as video conferencing with experts, 3d printing and simulation; and
- Anytime anywhere anything learning.

II. Mind the Gaps: Unequal Investments in Education Result in Striking Disparities in Achievement

The U.S. educational system is not as internationally competitive as it used to be. A June 2013 Council on Foreign Relations report documents just how far behind the U.S. has fallen in key education rankings.⁸ Over the past three decades, the U.S. has dropped 10 positions in both high school and higher education graduation rankings.

When educational systems fail, vulnerable populations are especially hard hit. The Council on Foreign Relations report warns of a growing achievement gap between the wealthy and the

7 Reed Hundt & Blair Levin, *The Politics of Abundance*, (Odyssey Editions 2012)

8 <http://www.cfr.org/united-states/remedial-education-federal-education-policy/p30141>

poor and the long-term negative impact on the nation's future productivity. Strikingly, the report does not focus on the average amount spent on education per student in the U.S., but rather on the unequal investments. The majority of developed countries invest more resources per pupil in lower-income school districts than in higher-income ones. It is the reverse in the United States, in large part because local property taxes provide most revenues for K-12 public schools. The investment gap continues in college and has increased significantly over time. If students find themselves in a resource-strapped environment, they are more likely to be plagued by achievement gaps for the rest of their lives.

III. Bridging the Digital Divide and Enhancing our Competitiveness: E-rate-supported Internet Infrastructure and Technology are Dynamic Tools that Schools and Libraries Can Use to Bridge Gaps in Resources and Help Prepare *All of Our Nation's Students to Succeed*

When faced with low funding per pupil, schools can use technology to give every child equal access to the same universe of knowledge while more efficiently stretching meager budgets to meet the needs of students and teachers. For example, more than 40% of our nation's high schools — particularly those serving low-income, minority, and rural youth — do not offer advanced placement (AP) courses.⁹ Seventy-five percent of districts use online learning to offer AP or college level courses.¹⁰

In Mooresville, North Carolina, despite being one of the lowest funds-per-pupil districts, the personalized use of laptops has helped the school district rise to become one of the state's leading performers.¹¹ In addition to creating a media rich teaching environment, the use of laptops has helped to spur adoption and use of broadband and computing technology in low-income families. Students train on the technology in school and help parents better understand the important and unique educational uses of broadband Internet access at home.

Access to adequate broadband capacity in our schools and libraries is not a luxury—it is a necessity for our next generation to be able to compete. Today and into the future, knowledge, jobs, and capital are going to migrate to places where workers have digital age skills, especially those in science, technology, engineering, and math (the STEM fields). STEM jobs are growing at a rate three times faster than other occupations.¹² And even opportunities outside of STEM

9 U.S. Department of Education, Expanding the Advanced Placement Incentive

Program, 2006, <http://www.ed.gov/about/inits/ed/competitiveness/expandingapip.html>

10 International Association for K-12 Online Learning: E-Rate 2.0: Defining Drivers and Capacity Needs.

<http://www.slideshare.net/iNACOL/i-nacol-2013-0806-erate-20-defining-drivers-and-capacity-needs>

11 <http://www.economist.com/news/briefing/21580136-new-technology-poised-disrupt-americas-schools-and-then-worlds-catching-last>

12 For example, for the month of June 2013, the technology sector alone accounted for 10% of new job growth. See Thibodeau, Patrick. Tech hiring accounts for 10% of U.S. employment gains. InfoWorld (July 8, 2013)

will be increasingly digitized. Students will need technology skills to become competitive in the worldwide workforce. The implications are clear. Workers who are not equipped with technology skills will be left vying for a shrinking pool of the lowest wage jobs.

But digital learning cannot take place at near dial-up speeds. In South Korea, 100 percent of schools are connected to broadband. With so much capacity, an effort is underway to transition all students from traditional textbooks to digital readers. In Uruguay, through a national program, nearly all primary and secondary schools have been connected to broadband and every primary school student has access to a free laptop. Uruguay also has revamped its secondary school science and math curricula, adding robotics and national math competitions.

Connecting all schools to high-speed broadband will help re-establish the U.S. as a global leader in education — setting an example for other countries that are struggling to improve their educational systems

IV. Rural America: E-rate Connects Distant and Remote Communities to the Full Universe of Educational Resources

For rural areas, high-capacity broadband is a vital tool for connecting schools to the best educational resources. In rural Idaho, schools are able to leverage broadband to expand curriculum offerings.¹³ By accessing courses and programs of study over the Internet, students are provided greater choice and flexibility. Advanced learners are no longer limited by the courses offered by their school, obtaining the coursework they need through online opportunities.

The Department of Commerce's Broadband Technology Opportunities Program¹⁴ (BTOP) has demonstrated the benefits of a flexible program that provides educational institutions (both schools and libraries) with access to robust broadband. The Utah Education Network (UEN) used BTOP funding to connect 41 school districts, libraries, colleges, and universities that serve nearly 800,000 students, faculty and staff.¹⁵ Because of this enhanced connectivity, high school students can access college courses; students in remote areas can cut down on travel time by

http://www.computerworld.com/s/article/9240626/Tech_hiring_accounts_for_10_of_U.S._employment_gains

13 <http://www.economist.com/news/briefing/21580136-new-technology-poised-disrupt-americas-schools-and-then-worlds-catching-last>

14 The American Recovery and Reinvestment Act provided the Department of Commerce's National Telecommunications and Information Administration (NTIA) and the U.S. Department of Agriculture's Rural Utilities Service (RUS) with \$7.2 billion to expand access to broadband services in the United States. Of those funds, the Act provided \$4.7 billion to NTIA to support the deployment of broadband infrastructure, enhance and expand public computer centers, encourage sustainable adoption of broadband service, and develop and maintain a nationwide public map of broadband service capability and availability. (http://www2.ntia.doc.gov/about_

15 http://www.cisco.com/web/strategy/docs/education/utaheducationnet_work.pdf

participating in robust online classes; and classroom instruction can be captured by video and reviewed by students as needed.

Island schools off the coast of Maine participating in the Maine Learning Technology Initiative use broadband-enabled video conferencing to provide richer programs to students. Teachers have to prep for every subject and every grade, since the school is effectively a “one-room” schoolhouse. By using broadband technology, they divide up the courses allowing teachers to focus on just one or two content areas. Students can access coursework on different content areas through their broadband Internet. Teachers also conduct classes with students on the other islands using video-conferencing, online coursework, videos/streaming, and interactive tools.¹⁶

Schools in Machias, Maine, located in a remote rural area, also use the network to expand beyond the traditional course offerings, like Japanese language courses.¹⁷ Remote learning can also help districts efficiently use local resources. For example, accelerated students can move to more challenging materials in different grades or in different schools (elementary through university level). Distributed courses in Maine are giving middle school students the option to take Algebra, a course otherwise not available in the building.¹⁸

V. Students and Educators: Broadband Technology is Transformative

Educational institutions around the country are taking steps to advance the use of technology and transform the way teachers teach and students learn. According to a new national online survey, 92 percent of teachers polled said they would like to use more educational technology in the classroom.¹⁹ Almost all teachers (between 87 percent and 96 percent) agree the use of educational technologies increases student engagement in learning, enables personalized learning, improves student outcomes, and helps students collaborate.²⁰

Broadband is enhancing the quality and effectiveness of instruction and improving the delivery of education by teachers. High-capacity broadband brings dynamic resources into the classroom while enabling seamless communication and partnering among teachers, students and parents.

Broadband connections enhance curricula at every grade level with dynamic and interactive Internet applications. These connections allow for:

16 <http://outerislandstlc.org>

17 <http://mainedoenews.net/2012/05/29/students-rock-mlti-conference/>

18 REL Online Algebra Study <http://archive.relnei.org/newsletters.php?nlid=29&nlapno=2>

19 <http://www.eschoolnews.com/2013/07/25/infographic-teachers-and-administrators-want-more-classroom-technology/>

20 <http://www.eschoolnews.com/2013/07/25/infographic-teachers-and-administrators-want-more-classroom-technology/>

- Personalized instruction that allows students to learn at the pace and in the way best suited for them to process information;
- Virtual field trips that can take students on tours of faraway places;
- Resource sharing;
- More interactive classrooms that allow teachers to leverage the popularity of an array of Web 2.0 interactive tools such as wikis, blogs, videoconferencing, and podcasting to supplement in-classroom learning. These tools can be used to enable a variety of blended learning experiences, including virtual work teams, which allow individuals to work together on specific projects; and
- Increased effectiveness.

Teachers and administrators are also using broadband for administrative tasks, lesson planning, student assessments, communication with other educators, posting course information online for students, and communicating with parents.

Broadband-enabled administrative tools provide schools an array of lower-cost options for pursuing certain information technology (IT) projects. Utilizing broadband also facilitates administrative and operational efficiencies. Specifically, for administrators, high-capacity broadband is used to:

- Improve the monitoring and management of student progress and achievement;
- Facilitate the aggregation, storage, and analysis of student-generated data; and
- Use of cloud-computing services to streamline various information technology processes.

Internet-based technologies and tools are already enhancing learning outcomes. By being more directly engaged in the learning process, students are able to more quickly master course content. They become adept at problem solving and can participate in the creation of their own content via various forms of media.

On the south side of Chicago, teachers have been using online reading games to track student progress and to identify students who need additional help.²¹ Broadband-enabled educational tools facilitate more interactive, personalized instruction, which has been found to improve learning outcomes. Many online academic enrichment services use video, animation, sound, and interaction to help children to learn, to excite them about a topic, and to reinforce concepts learned in class. High-capacity broadband is increasingly necessary to view multimedia Web sites. Some services offer real-time tutoring by connecting students to a live tutor through a video and audio feed.

21 <http://www.economist.com/news/briefing/21580136-new-technology-poised-disrupt-americas-schools-and-then-worlds-catching-last>

According to teachers in Idaho, technology is shifting the teaching dynamic from focusing on “what you're going to teach and how you're going to teach it to what the kids are learning and not learning.”²² This allows educators to efficiently utilize classroom time and space by using differentiated learning techniques.

At Forest Lake Elementary in South Carolina, students differ in income levels, ethnicities, family structures, first languages, interests, and abilities. With such a varied student population, a traditional teaching approach falls short. By integrating an array of digital technology tools, teachers and staff are able to challenge and support students at their own levels. The classrooms in Forest Lake are equipped with an interactive whiteboard and a Tech Zone of eight Internet-enabled computers. In addition, teachers have access to devices including digital cameras, Flip cameras, remote-response clickers, and personal digital assistants.²³

VI. The E-rate Program is Vital to Success in Schools

Thanks to the E-rate program, more than 100,000 schools and libraries have been connected to the Internet. When Congress passed the Telecommunications Act of 1996, only 14% of classrooms had Internet and most schools with Internet access (74%) used dial-up Internet access. By 2005, the E-rate program had successfully connected 94% of the nation’s classrooms to the Internet. By 2006, nearly all public libraries were connected to the Internet (98%).²⁴

In schools, emerging educational technology allows an increasingly interactive and individualized learning environment and expands school boundaries through distance learning applications. During the Senate Commerce Committee hearings on the E-rate, Sheryl Abshire, Chief Technology Officer of the Calcasieu Parish Public Schools in Lake Charles, Louisiana, highlighted how E-rate-funded infrastructure affected educational outcomes in her state. Starting in 1999 (the year after E-rate program funding began), students with special needs saw steady improvement on academic metrics by more than 25%. What is notable is that broadband not only helped create cost and time efficiencies within the administration of the district but also allowed teachers to use technology as a teaching aid. Technology served teachers as a supplement to instruction but also allowed teachers to track the progress of students, providing them with a robust tool for assessment.

Bandwidth needs are growing and even districts like Calcasieu will need additional E-rate funding to support the coming wave of online education and educational assessment. The Consortium for School Networking (COSN) recently conducted a survey where school IT professionals identified their top 3 priorities as

22 <http://www.edutopia.org/stw-online-learning-teacher-skills-video>

23 <http://www.edutopia.org/stw-differentiated-instruction-south-carolina>

24 <http://www.fcc.gov/document/fact-sheet-update-e-rate-broadband-schools-and-libraries>

1. Bring Your Own Device (BYOD) programs;
2. Assessment readiness
3. Broadband access

Common core state standard initiatives are, in large part, forcing schools to prepare their IT infrastructure for robust use for administrative and learning purposes. The recent Assessment Readiness Survey by Partnership for Assessment of Readiness for College and Careers (PARCC)²⁵ recently conducted a survey that found that 80% of schools will not meet the requirements for online assessments.”²⁶ Inadequate connectivity clearly has an effect during the teaching day but it can also cause delays and waste resources during administrative hours. New York City schools have such slow Internet that teachers had to use overtime to complete online assessments.²⁷

Unfortunately, the average U. S. school has about the same connectivity as the average American home, but serves 200 times as many users. Fewer than 20 percent of educators say their school’s Internet connection meets their teaching needs.²⁸ This unmet bandwidth demand is even more disturbing when considered against the backdrop of the current unmet funding demand. The budget for the E-rate program is about \$2.3 billion,²⁹ yet this year’s estimated application demand is \$4.986 billion.³⁰ Thus, if we want smarter kids, we need a smarter program that maximizes the use of every E-rate dollar to accelerate learning at broadband speeds. We must upgrade both *connectivity to the school door* and the *ability to distribute the connectivity to student devices in the classroom* using modern wired and wireless networks.

VII. Libraries Rely on E-rate to Connect and Serve their Communities

When libraries are connected to high-capacity broadband, the neighboring community benefits. Public libraries serve as critical gateways to information outside one’s own community, and, in the Information Age, this role has become even more important. Broadband has transformed the library from a center for research to a community center and place to learn about social services.³¹ Access to a robust broadband connection may soon be necessary simply to keep pace with changes in technology and the public’s growing data needs:

25 www.parcconline.org

26 See CoSN’s K-12 IT Leadership Survey 2013, available at <http://www.cosn.org/Default.aspx?TabId=14326>.

27 <http://riverdalepress.com/stories/Teachers-lament-sluggish-Internet,52924>

28 White House fact sheet, http://www.whitehouse.gov/sites/default/files/docs/connected_fact_sheet.pdf

29 <http://www.fcc.gov/encyclopedia/e-rate-schools-libraries-usf-program>

30 http://www.commerce.senate.gov/public/?a=Files.Serve&File_id=2a24e52e-e5b2-4909-a319-bfe8f2ade37a

31 <http://www.tampabay.com/news/humaninterest/librarians-now-add-social-work-to-their-resumes/1008244>

- Residents in underserved communities such as rural or low-income areas where many homes lack access to broadband rely on free Internet connectivity from their local public library.
- Many libraries provide information literacy training that allows less tech-savvy individuals to engage the Internet in ways they otherwise wouldn't.
- Senior citizens, many of whom do not own home computers, find public libraries helpful for finding information on health issues or government programs and maintaining connections with family and friends who live far away.
- As central public meeting spaces within communities, libraries connected to broadband can serve as disaster response centers during floods, fires or hurricanes.

Librarians use broadband for business functions, such as running online catalogs, managing digitized content, connecting remote or small libraries to larger institutions, and serving patrons through e-mail and online reference. Libraries can also pull in broadband Internet to a community that would otherwise be left with no robust access. The Gigabit Libraries Network has just announced pilots to demonstrate the extent to which TV whitespace technology and Wi-Fi can be used to reach Internet users in underserved areas. The pilots will allow libraries in Delta County, Colo.; Pascagoula, Miss.; Skokie, Ill.; Humboldt County, Calif.; New Hampshire, and several cities in Kansas the ability to try out programs like the “e-bookmobile”, using robust wireless broadband.³²

VIII. The E-rate Program Needs to Expand and Modernize to Meet Current and Future Educational Needs

Due to the successful creation and implementation of the E-rate program, schools and libraries have been able to connect their students, teachers and communities to the Internet. Considering the growing importance of high-speed Internet access, technology skills, and robust broadband for administrative and educational purposes, program funds must grow to meet these needs.

There are a number of vital learning technologies that can only be used in the classroom with adequate broadband speeds.

A. Streaming Educational Video

Digital learning is transforming education and online video is at the center of this transformation. PBS Video and Khan Academy, for example, can give every student access to advanced educational video instruction, regardless of whether their school offers a particular course. In a 2010 teacher survey,³³ PBS and Grunwald Associates found that the percentage of teachers reporting that they stream or download video content in the classroom increased from 55% in 2007, to 76% in 2010. However, most of the teachers (78%) also reported bandwidth-associated

³² <http://www.govtech.com/network/Super-Wi-Fi-Pilot-Hits-Libraries-Around-the-Country.html>

³³ http://www-tc.pbs.org/about/media/about/cms_page_media/182/PBS-Grunwald-2011e.pdf

problems – skipping, pausing or constant buffering – when they streamed video indicating that their “computing devices or technology infrastructure, or both, do not yet have the capacity to handle teachers’ increasingly Internet-dependent instructional activity.” As the President noted in announcing the ConnectED effort, “Thousands of schools don’t even have the bandwidth to stream two videos into their school at the same time.” To put this in context, it takes about 1.5 megabits to stream standard definition video in the classroom.³⁴ Assuming every student is using video as a learning tool at his or her own pace, you’d need 45 megabits of connectivity for a 30-student classroom. As technology advances and schools use applications such as high-definition video more intensively, they will need to grow their capacity over time.

B. Two-Way Video Communication

With adequate bandwidth, teachers are able to use free tools like Skype to break down the walls of the classroom, connecting students with experts around the world to open up new worlds of opportunity. For example, students are already using online videoconferencing to

- Connect with an applied geneticist 1200 miles away for an AP biology class, a teacher in Taiwan to explain the Chinese New Year and military personnel around the world;
- take virtual field trips to exotic and educational locations.³⁵

But a five-site multi-party high-definition (HD) videoconference can require as much as 7 Mbps of connectivity.³⁶ Many schools and libraries, however, are still living in the dial-up age, and are missing out on the ability to expand their learning by expanding their classrooms.

C. 3D-Printing

We know that hands-on learning is one of the most effective forms of education. Additive manufacturing or three dimensional (3D) printing is a process of making a three-dimensional solid object of virtually any shape from a digital model. 3D printers are becoming more ubiquitous in higher education institutions, as the prices of these machines decrease and their education value rises. Similarly, it is becoming more important to incorporate 3D printers into public schools – especially those serving the visually impaired.³⁷ Just imagine if a child could study evolution by printing a Neanderthal skull to compare to her own, to study history with actual printed artifacts from Egypt, study science by bringing microscopic organisms to human scale, print a copy of Leonardo de Vinci’s ornothopter, or stare directly into an actual life size replica of Abraham Lincoln’s life mask. But the tools to use 3D printers require higher bandwidth. For example, to create a 3D model for printing, students can take traditional 2D digital photos with a mobile

34 Netflix says that an Internet connection of at least 1.5 Mbps is necessary to stream videos at the lowest possible quality.

35 <http://www.livebinders.com/play/play/139611?present=true>

36 Cisco, High-Speed Broadband in Every

Classroom: The Promise of a
Modernized E-Rate Program

http://www.cisco.com/web/strategy/docs/education/e_rate_connected_wp.pdf

37 3D printers can cost as little as \$500 each -- about the cost of a 2 dimensional printer just a few years ago.

device or digital camera and transmit it to the cloud for creating a 3D model.³⁸ But this requires vast amounts of data bandwidth for which many schools just don't have the capacity.

D. Game-based learning

In order to change the game in education, many believe we need to find ways to get kids more engaged in learning, by harnessing higher speed broadband to make learning as captivating as the best video games. Education professor Dr. James Paul Gee of the University of Wisconsin concluded that video games intermix instruction and demonstration, a more effective learning technique than the style currently found in most classrooms. A recent study conducted by researchers at the University of Michigan found that video puzzle games that exercise children's working memories can enhance their abstract reasoning and problem-solving skills, which can have a direct impact on future educational and occupational success. A study conducted by scientists at the University of Rochester found that video games can improve players' vision, attention and certain cognitive skills. Study participants also performed better than non-gamers on certain tests of speed, accuracy and multitasking. However, modern educational gaming platforms recommend a minimum of 1.5 mbps of connectivity to provide a rich learning environment.³⁹

Unfortunately while new technologies can unlock new learning potential, only around 20 percent of our students have access to true high-speed Internet in their classroom. By comparison, South Korea has 100 percent of its kids with high-speed Internet.

IX. Conclusion

Modernizing the E-Rate program is critical to ushering in a new era of digital learning in America's K-12 schools and public libraries. However, the program in its current form cannot meet the connectivity and infrastructure needs of community institutions. The E-rate program should be focused on broadband connectivity and infrastructure to ensure we maximize the impact of the program on learning. The program should enable schools to access funding for the one-time investment to connect every school and library to fiber and every classroom to ubiquitous wireless networks. To do so, the Commission must reform the way the program is managed to reduce costs, improve efficiency and ensure that all students have access to the connectivity they need.

More specifically the Commission should:

- Modernize the E-Rate program to make smarter use of every E-Rate dollar, develop robust bandwidth goals for meeting our children's learning needs, and then right-size the E-rate cap to ensure schools and libraries have the funding necessary on a permanent basis for the bandwidth we need to meet our educational goals.

38 Make a 3D print of anything, <http://www.extremetech.com/extreme/103701-autodesk-catch-make-a-3d-print-of-anything>

39 Microsoft recommends a minimum of 1.5 mbps for its new gaming platform. <http://www.gamechup.com/microsoft-recommends1-5-mbps-minimum-broadband-speed-for-xbox-one/>

- Build a transparent and open listing of prices and speeds with respect to telecommunications services and equipment.
- Support the capital investment costs of deploying high-capacity broadband to schools and libraries in areas where it is not currently available. Investing in this infrastructure allows community institutions to build a strong foundation for their current and future technology needs.
- Provide schools with flexibility and choice with respect to the most cost-effective infrastructure investment. Equalize the treatment of dark fiber and lit fiber services by allowing dark fiber electronics and construction costs to be eligible for E-rate support.
- Encourage school and libraries to think outside of the box to serve the needs of their communities. Clarify and make explicit the rules that allow schools and libraries that receive E-rate support to use a portion of their broadband capacity for community “hot spots.”

The Commission has the opportunity to take historic steps to ensure that every child has access to the same universe of knowledge and learning potential wherever they live and regardless of their economic circumstances. Taking such action will impact not just the future well-being of today’s students and educators, but will have a profound impact on meeting the needs of both, future businesses and job seekers, and our economic competitiveness as a nation. For all of the foregoing reasons, and to deliver the highest bandwidth to the most students at the lowest cost, and in the shortest amount of time, the Benton Foundation respectfully requests that the Commission issue an Order in this proceeding consistent with the recommendations set forth herein.

Respectfully submitted,

/s/

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